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AMBIENT AIR QUALITY MONITORING PLAN

CUMBERLAND STEAM PLANT

AIR RESOURCES PROGRAM

TVA/ONR/ARP-81/17

TENNESSEE VALLEY AUTHORITY

Office of Natural Resources

Air Resources Program

AMBIENT AIR QUALITY MONITORING PLAN

CUMBERLAND STEAM PLANT

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Ambient Air Quality Monitoring Plan

Cumberland Steam Plant

Introduction

The Tennessee Valley Authority (TVA) has conducted ambient air quality monitoring at Cumberland Steam Plant since 1971. The monitoring network was operated to collect background air quality information prior to plant startup (1972) and to document ambient air quality after the plant reached full operating levels in 1973.

In 1973, TVA sought to bring the steam plant into compliance with provisions of the Clean Air Act by demonstrating that it met applicable ambient air quality standards for sulfur dioxide (SO_2). This option was allowed at that time by the Tennessee State Implementation Plan and was selected by TVA as being the most cost-effective and practical means of achieving compliance.

TVA's strategy for meeting ambient standards was of its Sulfur Dioxide Emission Limitation (SDEL) program. This program controlled plant emissions through the intermittent reduction of power generation under meteorological conditions conducive to high ambient SO_2 levels and exceedance of standards. Six SO_2 monitors were added to the existing network to provide monitoring support for the SDEL program. Data from the monitoring network were used to verify that SO_2 standards were not exceeded and to upgrade SDEL program effectiveness.

The SDEL program operated continuously at Cumberland from 1973 until its interruption in October 1980 due to an explosion in one of the boilers. It was reactivated in April 1981 after the damaged boiler was repaired and the unit resumed operations. The SDEL program was integrated into the proposed Consent Decree interim control plan in 1978 for the purpose of controlling SO_2 and particulate emissions until the plant met required emission standards. The consent decree stipulated that the plant should meet SO_2 emission standards by November 1981 and particulate emission standards by May 1982.

In order to meet the required 5.0 $lb/10^6$ Btu SO_2 emission standard, a new coal washing facility is being constructed near the steam plant. Also, new electrostatic precipitators are being installed to meet the 0.10 $lb/10^6$ Btu particulate emission standard.

There are Tennessee regulations that require TVA to conduct ambient monitoring at the Cumberland Steam Plant. Tennessee Division of Air Pollution Regulations (dated June 1979) empower the State agency to direct source owners to perform ambient air quality monitoring. These regulations (Chapter 1200-3-14-.02, Non-Process Emission Standards), state that "every owner or operator of a fuel burning installation having a total rated capacity greater than 1000 million Btu per hour shall:

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1. Demonstrate to the satisfaction of the Technical Secretary, that the sulfur dioxide emitted, either alone or in contribution to other sources, will not interfere with attainment and maintenance of any primary ambient air quality standard.

2. Install and maintain air quality sensors to monitor attainment and maintenance of ambient air quality standards in the areas influenced by the emissions from such installations. Such shall be done in a manner prescribed by the Technical Secretary. Results of such monitoring shall be provided to the Technical Secretary in a manner and form as he shall direct."

Appendix A contains these Tennessee regulations in their entirety and letters from the Environmental Protection Agency (EPA) which approve TVA's methodology for measuring ambient SO_2 and total suspended particulate (TSP). Since TVA has voluntarily complied with the intent and purpose of these regulations, the State agency has not considered it necessary to officially direct TVA to conduct ambient monitoring.

The purpose of this monitoring plan is to present a new network design for Cumberland Steam Plant.[1]

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1. All TSP monitors will be collocated with SO_2 monitors to document ambient TSP levels that are attributable to steam plant stack emissions.

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Background Information

To determine the current status of air quality conditions at Cumberland Steam Plant, a review was made of operating loads, emissions data, air quality data, and other related information for the period 1975 through 1979.

The Cumberland Steam Plant consists of two pulverized coal-fired 1300-megawatt (MW) units, each served by a 304-m stack. The plant has a total generating capacity of 2600 MW and is the largest coal-fired plant in the TVA system. Each unit is equipped with electrostatic precipitators for reducing particulate emissions. The monthly average electrical generation rate at Cumberland Steam Plant for the years 1975 through 1979 is shown in figure 1. During this period the plant operated between approximately 550 and 1400 MW monthly. The monthly average SO_2 emissions from the Cumberland Steam Plant for the years 1975 through 1979 are shown in figure 2.

The maximum and second highest 3- and 24-hour SO_2 concentrations measured in the vicinity of Cumberland Steam Plant (figure 3) from 1975 through 1979 are shown in figure 4.

Systematic botanical surveys were conducted during the 1976 through 1979 growing seasons (May-September) to determine if SO_2 emissions from Cumberland Steam Plant had visibly affected sensitive vegetation. Three surveys were conducted each growing season, 1976 through 1978, and one survey in 1979. During these surveys, no foliar effects attributable to Cumberland Steam Plant SO_2 emissions were observed.

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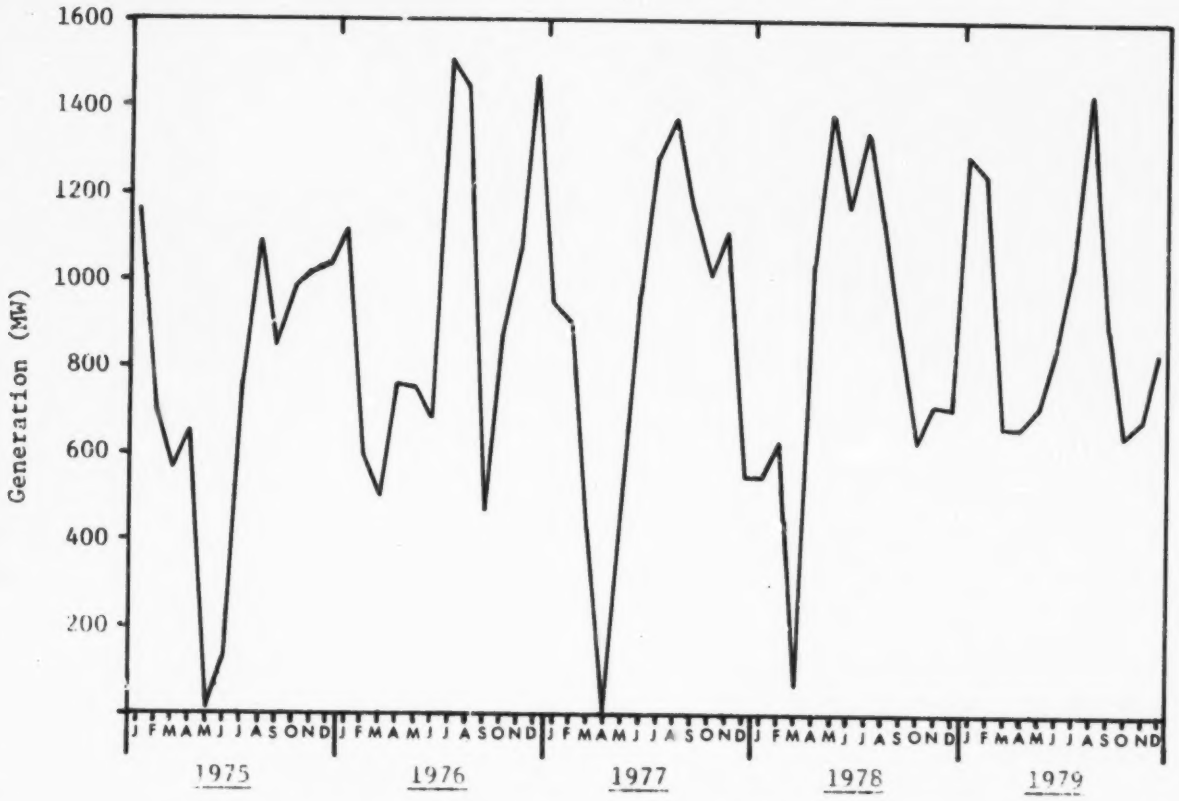
1600
1400
1200
1000
800
600
400
200
Generation (MW)
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1975
1976
1977
1978
1979

Figure 1. PLANT OPERATING LEVEL - CUMBERLAND STEAM PLANT, 1975-1979

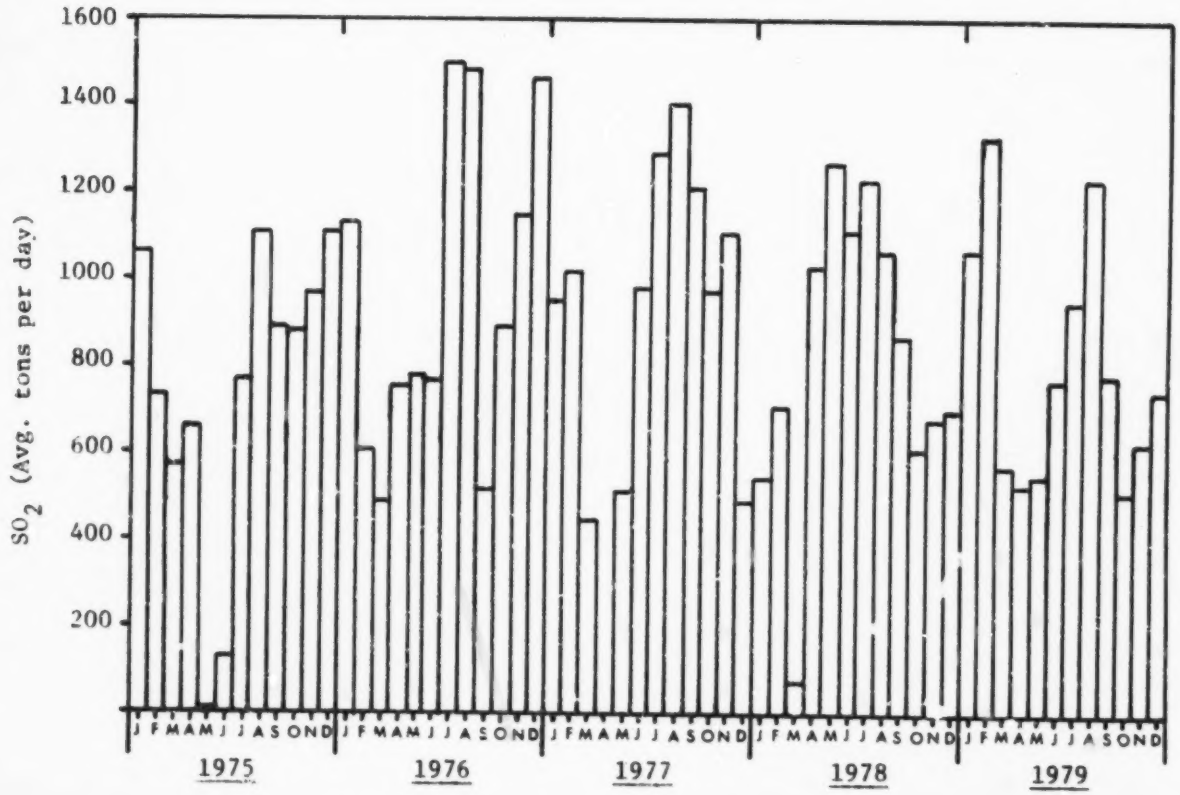
1600
1400
1200
1000
800
600
400
200
SO_2 (Avg. tons per day)
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1975
1976
1977
1978
1979

Figure 2. SO_2 EMISSIONS - CUMBERLAND STEAM PLANT, 1975-1979

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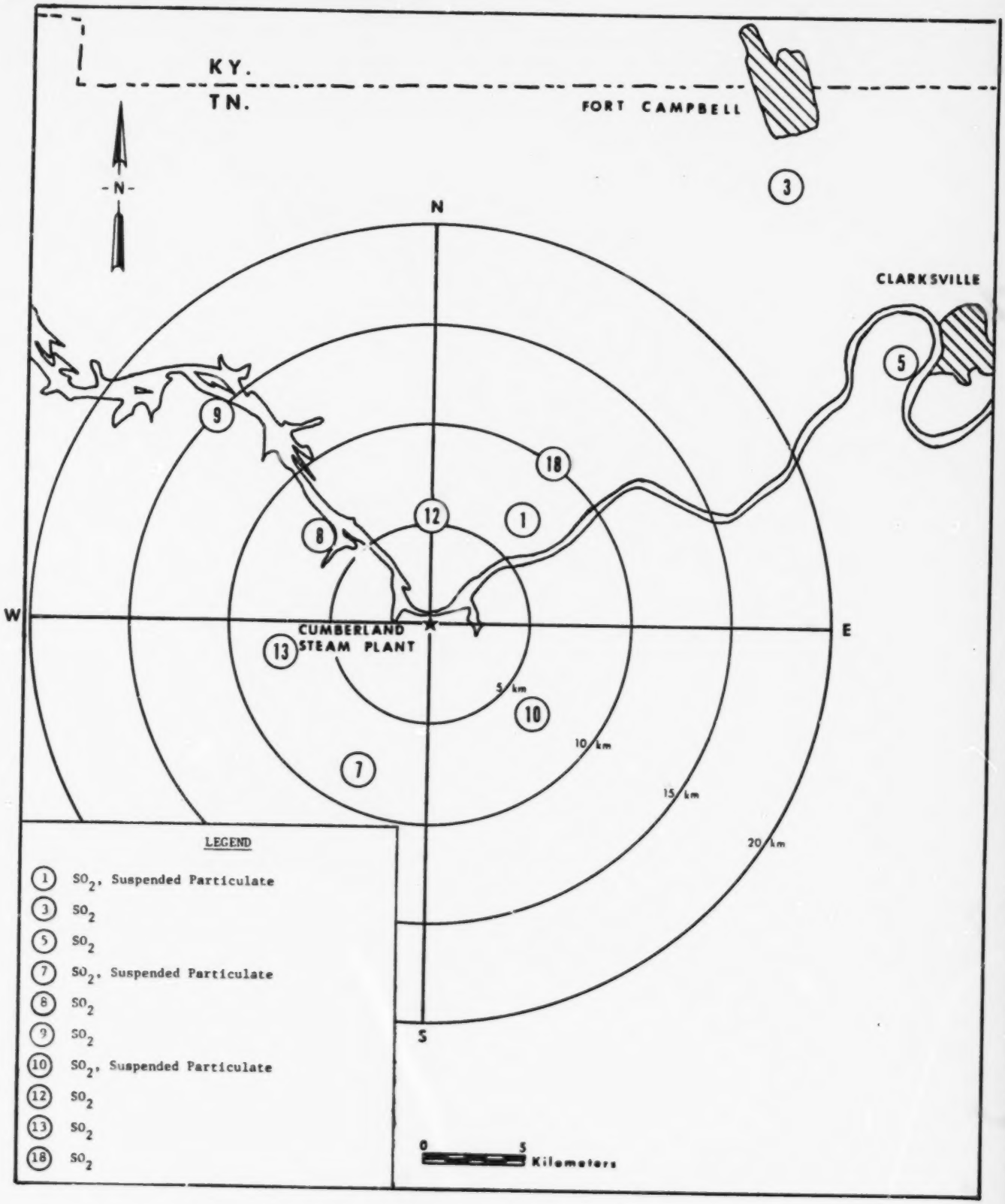

Figure 3. EXISTING AMBIENT AIR QUALITY MONITORING NETWORK AT THE CUMBERLAND STEAM PLANT

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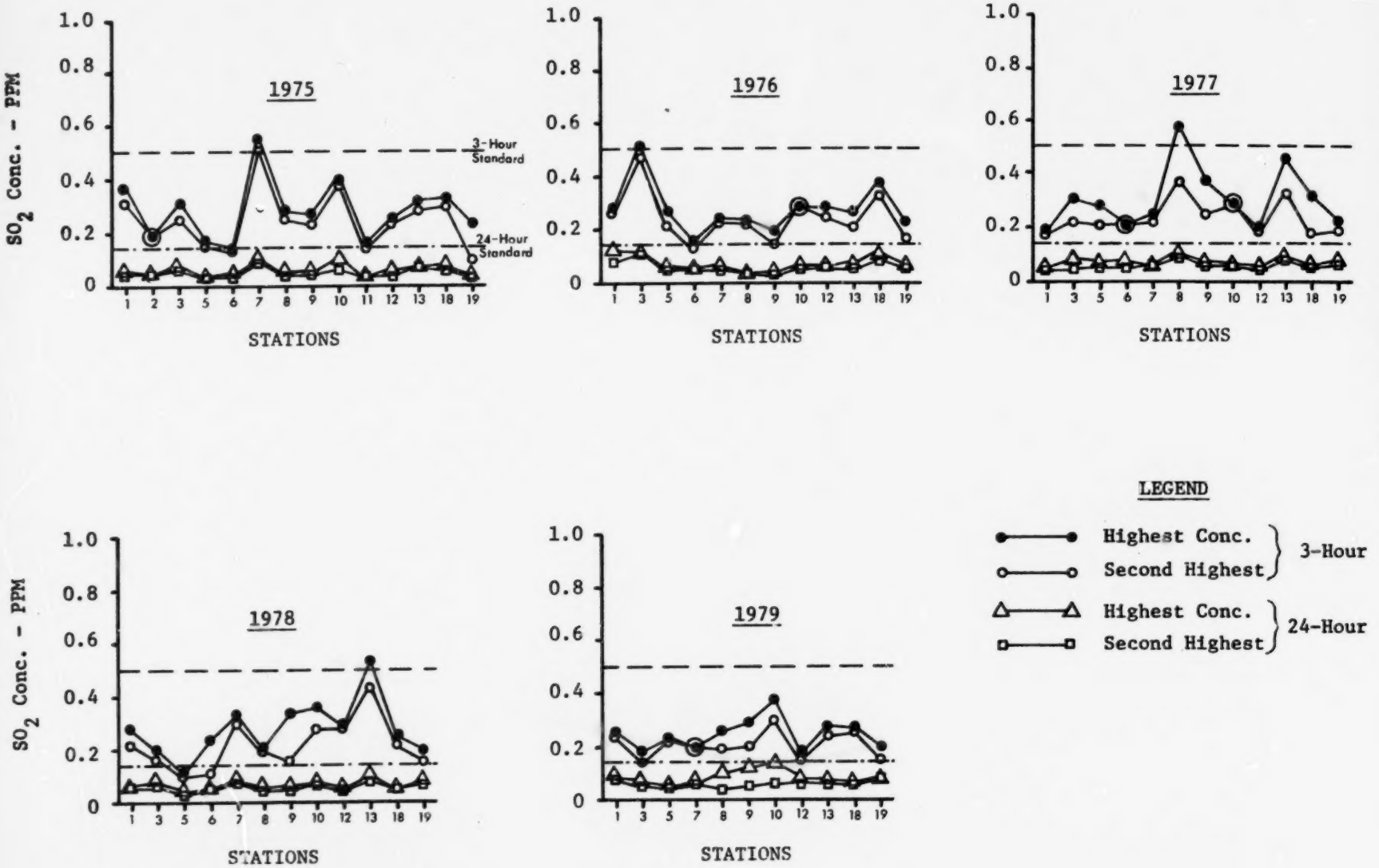

Figure 4. MAXIMUM AND SECOND HIGHEST 3- AND 24-HOUR AVERAGE SO_2 CONCENTRATIONS MEASURED AT STATIONS IN THE CUMBERLAND STEAM PLANT MONITORING NETWORK, 1975-1979

Approach

The development of a network design for Cumberland Steam Plant involved the following steps.

1. Objectives were identified, evaluated, and defined in terms of present and future needs and requirements.

2. A modeling analysis was performed to identify sites where highest SO_2 concentrations may be expected to occur with some frequency under various atmospheric conditions.

3. Past air quality, meteorological, plant operating, and botanical effects data were evaluated to determine which existing monitoring stations were most effective in documenting ambient levels.

4. After an evaluation was made of the information compiled in steps 1 through 3, judgments were made about which sites would best satisfy monitoring objectives.

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Objectives for Air Quality Monitoring

TVA conducts ambient air quality monitoring in the vicinity of Cumberland to determine the impact of its gaseous and particulate emissions and to determine compliance with standards. The primary and secondary objectives are as follows:

A. Primary Objectives

1. Monitor in areas expected to receive high 3- and 24-hour SO_2 concentrations with significant frequency.

2. Monitor in areas expected to receive high 24-hour TSP concentrations.

TVA also conducts its monitoring to meet the following additional, although less constraining, objectives when possible to more adequately characterize air quality conditions:

B. Secondary Objectives

1. Monitor in areas of combined impact from the TVA plant and other major SO_2 sources.

2. Monitor to obtain overall area coverage of pollutant levels.

3. Preferentially monitor in populated areas over nonpopulated areas.

In selecting monitor site locations, primary objectives were met, and secondary objectives were met when practical.

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Methods

Modeling

Ground-level SO_2 concentrations from Cumberland were calculated using a modified version of EPA's CRSTER model to identify candidate areas for SO_2 monitor sites. The frequency of occurrence of concentrations above a specified threshold was used as the criterion for selecting candidate areas. To ensure that monitors would be properly located to measure high concentrations during all dispersion conditions, candidate areas were selected for each dispersion condition. In order to obtain the required modeling results, the CRSTER program was modified to calculate the concentrations for only those 3-hour periods with constant or nearly constant dispersion conditions. Specifically, the meteorological input was screened to ensure that the 3-hour periods met one of the following four conditions: (1) two hours of stability class "A", (2) three hours of stability class "B", (3) three hours of either stability class "C" or "D", or (4) three hours of either stability class "E" or "F". Projections of 24-hour-average concentration levels were not subject to this screening procedure.

Five years (1970-1974) of hourly Nashville meteorological surface data and concurrent Nashville mixing height data were used in the analysis so that year-to-year variations in meteorological and dispersion characteristics would be considered. Stack exit parameters with the plant operating at 100, 75, and 50 percent of nameplate capacity were used in the study to determine the range of SO_2 concentrations under identical meteorological conditions.[2]

Ranking Site Effectiveness

Existing air monitoring stations were ranked with regard to their effectiveness in meeting the primary monitoring objectives. To determine ranking values, individual factors were assigned various weights (depending on their importance) which were used to calculate numerical values for each station. Weighted values were subsequently totaled and stations ranked according to their numerical value.

Stations were ranked according to the following factors:

A. An important factor was the magnitude of the average level of the measurements (in terms of the maximum and second highest 3- and 24-hour SO_2 concentrations) made at each monitor from 1975 through 1979. The stations with the lowest and highest average SO_2 concentration for each of these factors during the five-year period were assigned 0 and 15 points respectively, with intermediate stations receiving weighted values in proportion to their average levels.

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2. A more extensive discussion of modeling analysis for the Cumberland Steam Plant is presented in a separate Air Resources Program report which is available upon request.

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B. A factor that was considered of equal importance was the frequency that 3- and 24-hour average SO_2 concentrations were recorded in excess of a significant level from 1975 through 1979. Base levels of 0.15 and 0.030 ppm respectively were established by taking the highest value exceeded at each station at least once during the period. These values were used since they provided the largest "spread" of points from top station to bottom station. The station with the lowest average frequency was assigned 0 points, and the station with the highest was assigned 15 points, with other stations receiving weighted values in proportion to their average values.

C. Equally important was the measurement of exceedances of the 3- and 24-hour National Ambient Air Quality Standard (NAAQS) during the period 1975 through 1979. The station that recorded the greatest number of exceedances was assigned 15 points with the remaining stations receiving weighted values in relation to the number of times they recorded these concentrations. Those stations where no standard exceedances were recorded received zero points.

D. An additional factor was whether a station was located in or near (within 1 km) areas where SO_2-affected vegetation was observed during the study period. A station located in or near such areas the greatest number of times was assigned 15 points. Remaining stations received weighted values proportional to the number of times they were in or near those areas. Since there were no known adverse botanical effects during the evaluation period, all stations received zero points for this factor.

E. Lastly, the location of a station in a predominantly downwind sector from the power plant (1975-1979) was also considered an important factor in determining monitor effectiveness. Although this factor is not directly associated with the time period and severity of SO_2 concentrations impacting a monitor, the probability of such an occurrence is enhanced. In rating this factor, monitors downwind the greatest percentage of time were assigned a maximum of 10 points and those downwind the least percentage 0 points, with subsequent monitors receiving weighted values proportional to their downwind percentages.

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Discussion of Results

Modeling

The results of the modeling study are shown in figure 5. The modeled maximum 3-hour SO_2 concentration impact points for stability classes "A", "B", "C/D", and "E/F", and the maximum 24-hour impact points for stability class "A" are ranked in order of their priority.

As expected, the points of highest maximum impact with the greatest frequency were predicted for stability class "A" conditions. Six sites, located 1.4 to 2.0 km from the power plant, had the highest frequency of occurrence of 3-hour average concentrations that were equal to or greater than 0.288 ppm. The highest frequency was predicted at site A-1 and the highest concentrations also occur near this site.

The area between 4.0 and 7.0 km from the power plant was predicted to be impacted by 3-hour average SO_2 concentrations equal to or greater than 0.183 ppm under "B" stability conditions. Both the magnitude and frequency of occurrence were largest at site B-1, followed in importance by "hot spots" at sites B-2 and B-3.

Predicted high 3-hour (figure 5) SO_2 concentrations (in excess of 0.115 ppm) for stability class "C/D" occurred at six sites around the power plant ranging from 7 to 12.5 km. Probable "hot spots" are sites C-1 through C-6 in order of their priority.

Predicted highest-of-the-second-highest 3-hour ground-level concentrations during "E/F" stabilities occurred at a distance of 34 km and did not exceed 0.043 ppm. Because this estimate falls in the range of background SO_2 levels around the Cumberland Steam Plant, the region of maximum impact under "E" and "F" conditions was not considered in selecting monitoring sites.

Projected maximum 24-hour average SO_2 concentration impact points were within 2 km of the power plant. In each area, the predicted 24-hour average levels were in excess of 0.05 ppm. These areas (24-1, A-2, and A-5) coincide well with the 3-hour maximum impact points predicted under stability class "A" conditions.

Ranking of Effectiveness

Existing air monitoring stations in the vicinity of Cumberland Steam Plant were evaluated according to the five factors described in the "Methods" section. Weighted values were assigned each station in relation to the magnitude and frequency of SO_2 levels recorded, proximity to areas of SO_2-affected vegetation, number of NAAQS excesses, and downwind percentages as shown in figures 5 and 6, and in tables 1, 2, and 3. Values assigned each monitoring station according to factors A through E were totaled, and stations were ranked according to their numerical value (table 4). Station 18 scored highest in the ranking scheme, followed by stations 7, 10 and 13.

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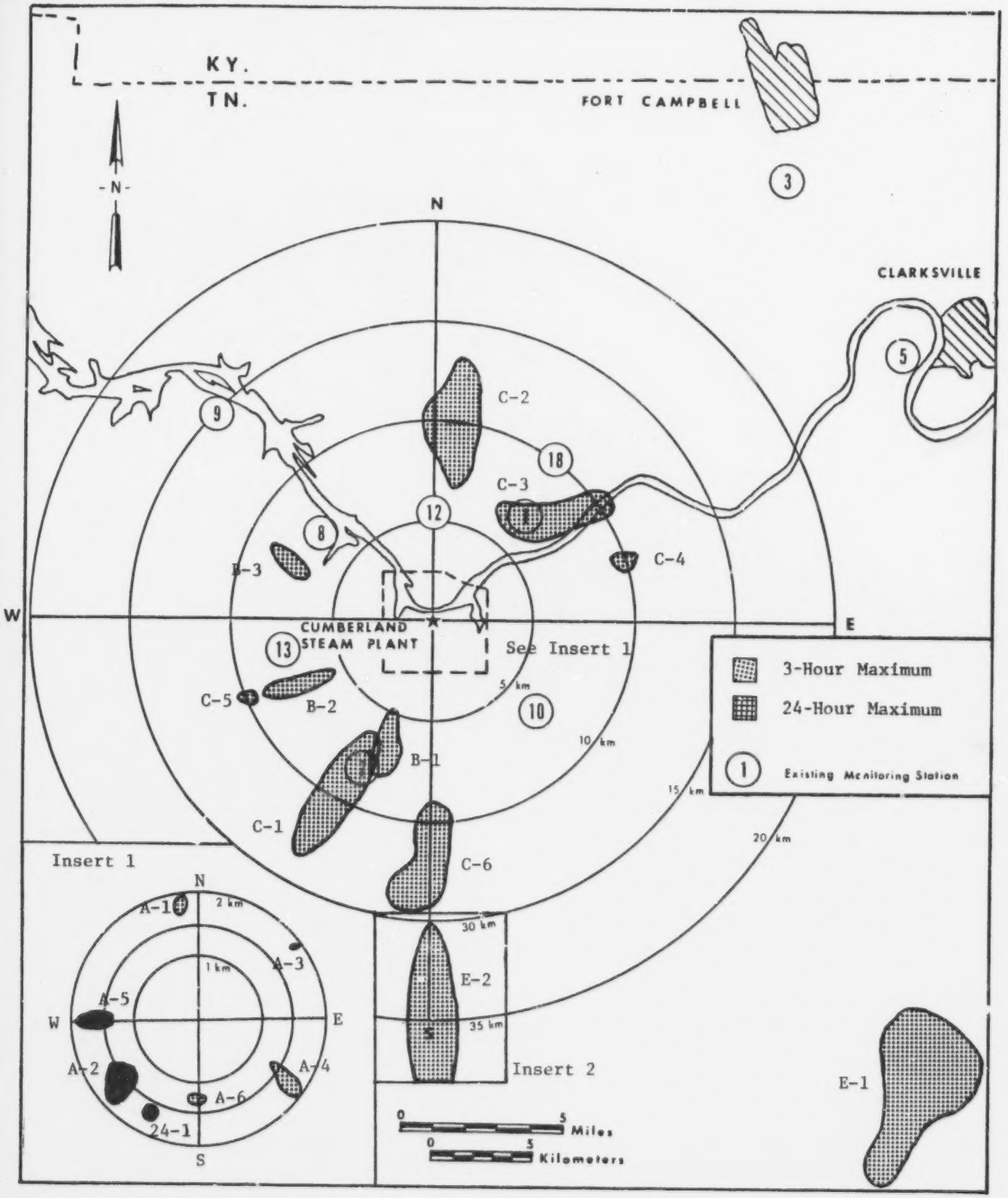

Figure 5. MODELED MAXIMUM 3- AND 24-HOUR SO_2 CONCENTRATION IMPACT POINTS IN THE VICINITY OF THE CUMBERLAND STEAM PLANT

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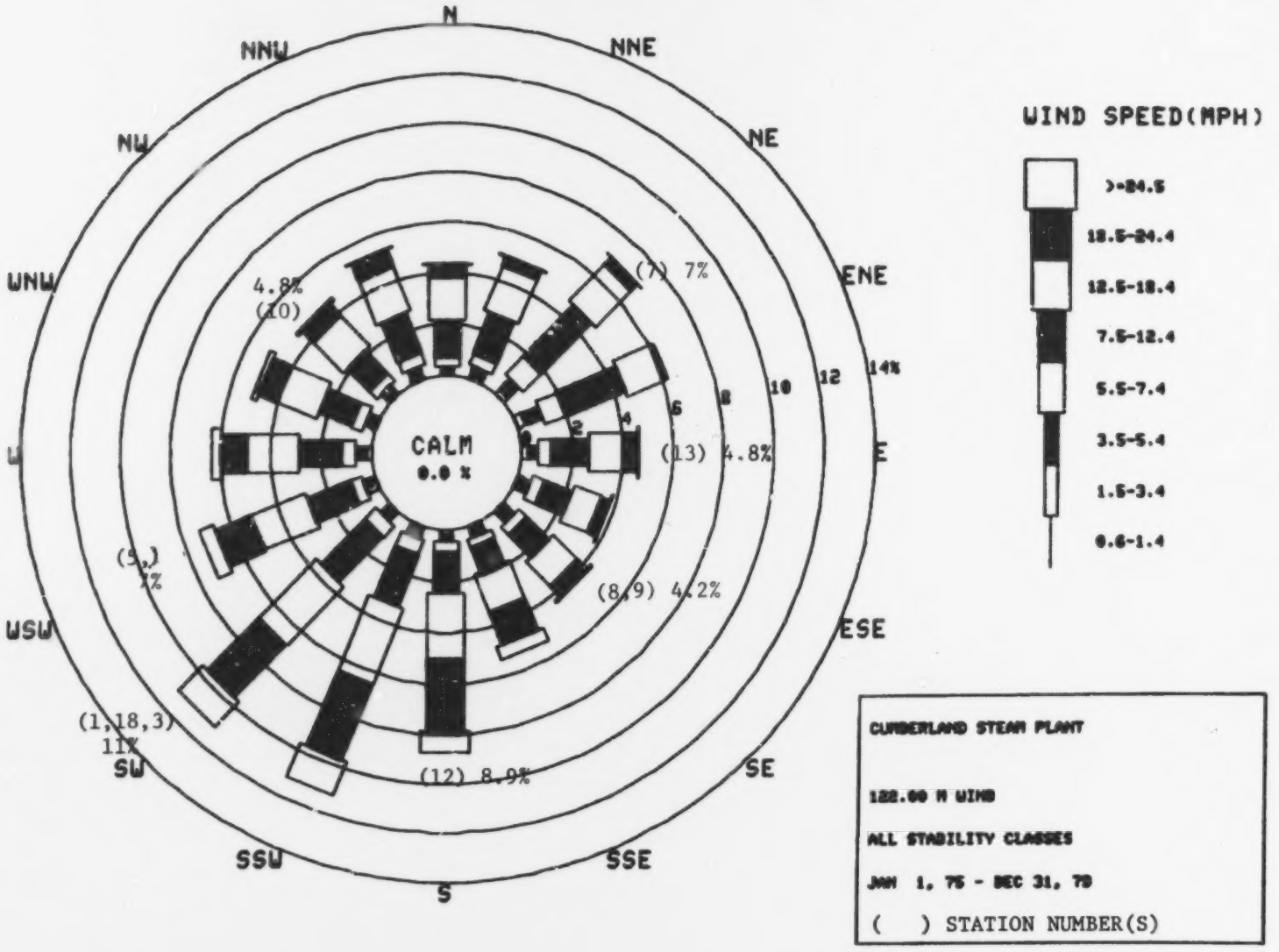

Figure 6. THE PERCENTAGE OF TIME EXISTING MONITORS WERE DOWNWIND OF THE CUMBERLAND STEAM PLANT

Table 1

MAXIMUM AND SECOND HIGHEST 3-HOUR AVERAGE AND 24-HOUR AVERAGE SO_2 CONCENTRATIONS MEASURED AT THE CUMBERLAND STEAM PLANT, 1975-1979

3-Hour Concentrations (ppm)

Station Number	1975		1976		1977		1978		1979		Average[a] (ppm)
	Max	2nd	Max	2nd	Max	2nd	Max	2nd	Max	2nd	
1	0.37	0.26	0.28	0.27	0.19	0.18	0.28	0.22	0.25	0.24	0.25
3	0.31	0.25	0.52	0.47	0.31	0.27	0.20	0.16	0.18	0.14	0.28
5	0.17	0.15	0.27	0.22	0.28	0.21	0.11	0.10	0.23	0.22	0.20
7	0.55	0.51	0.24	0.23	0.25	0.22	0.33	0.31	0.20	0.20	0.30
8	0.28	0.25	0.24	0.23	0.53	0.37	0.21	0.20	0.26	0.19	0.28
9	0.27	0.23	0.20	0.15	0.37	0.25	0.34	0.16	0.29	0.20	0.25
10	0.40	0.39	0.29	0.29	0.29	0.29	0.36	0.28	0.38	0.30	0.30
12	0.25	0.23	0.29	0.25	0.20	0.18	0.29	0.28	0.18	0.15	0.23
13	0.32	0.28	0.27	0.21	0.46	0.33	0.54	0.44	0.28	0.24	0.34
18	0.33	0.30	0.38	0.33	0.32	0.18	0.25	0.22	0.27	0.25	0.28

24-Hour Concentrations (ppm)

Station Number	1975		1976		1977		1978		1979		Average[a] (ppm)
	Max	2nd	Max	2nd	Max	2nd	Max	2nd	Max	2nd	
1	0.06	0.05	0.12	0.08	0.05	0.04	0.06	0.06	0.08	0.07	0.07
3	0.08	0.06	0.12	0.11	0.08	0.04	0.07	0.06	0.07	0.05	0.07
5	0.03	0.03	0.06	0.05	0.07	0.05	0.04	0.03	0.05	0.04	0.05
7	0.10	0.09	0.06	0.05	0.06	0.06	0.09	0.07	0.06	0.05	0.07
8	0.05	0.04	0.04	0.04	0.10	0.09	0.06	0.05	0.10	0.04	0.06
9	0.05	0.04	0.04	0.03	0.07	0.06	0.07	0.05	0.12	0.05	0.06
10	0.10	0.06	0.07	0.06	0.06	0.06	0.08	0.07	0.14	0.06	0.08
12	0.06	0.04	0.06	0.06	0.05	0.04	0.06	0.05	0.08	0.06	0.06
13	0.07	0.07	0.07	0.06	0.09	0.08	0.11	0.08	0.08	0.06	0.07
18	0.08	0.06	0.12	0.09	0.06	0.05	0.06	0.06	0.07	0.06	0.07

a. Average of all values shown.

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Table 2

FREQUENCY OF 3-HOUR AVERAGE AND 24-HOUR AVERAGE SO_2 CONCENTRATIONS MEASURED AT THE CUMBERLAND STEAM PLANT, 1975-1979

Station	3-Hour Frequencies (%>0.15 ppm)					
	1975	1976	1977	1978	1979	Avg.[a]
1	0.73	0.83	0.44	0.[illegible]	0.47	0.57
3	0.57	0.52	0.28	0.26	0.21	0.37
5	0.12	0.60	0.31	0.01	0.13	0.23
7	0.45	0.40	0.59	0.58	0.47	0.50
8	0.33	0.50	0.50	0.28	0.27	0.38
9	0.29	0.33	0.30	0.18	0.23	0.27
10	0.70	1.03	0.80	0.59	0.57	0.70
12	0.48	0.61	0.47	0.57	0.28	0.48
13	0.64	0.36	0.62	0.56	0.40	0.52
18	1.85	0.83	0.62	0.76	0.55	0.92

Station	24-Hour Frequencies (%>0.030 ppm)					
	1975	1976	1977	1978	1979	Avg.[a]
1	6.77	6.06	2.06	7.26	5.61	5.55
3	6.30	4.58	2.51	6.34	3.71	4.69
5	1.49	2.68	2.51	1.11	2.54	2.07
7	4.68	3.06	3.10	10.50	6.59	5.59
8	2.34	2.14	2.55	2.86	4.06	2.79
9	3.13	0.65	2.84	5.83	4.55	3.40
10	6.76	6.90	5.65	9.20	5.14	6.73
12	3.12	3.36	10.03	7.56	5.37	5.89
13	5.66	2.52	3.32	7.24	6.30	5.01
18	13.02	7.91	4.12	8.36	7.51	8.18

a. Average of all values shown.

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Table 3

NUMBER OF 3-HOUR AVERAGE AND 24-HOUR AVERAGE NAAQS EXCEEDANCES RECORDED AT THE CUMBERLAND STEAM PLANT, 1975-1979

Station Number	1975		1976		1977		1978		1979		Total
	3-hr	24-hr	3-hr	24-hr	3-hr	24-hr	3-hr	24-hr	3-hr	24-hr	
1	0	0	0	0	0	0	0	0	0	0	0
3	0	0	1	0	0	0	0	0	0	0	1
5	0	0	0	0	0	0	0	0	0	0	0
7	2	0	0	0	0	0	0	0	0	0	2
8	0	0	0	0	1	0	0	0	0	0	1
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	1	0	0	0	1
18	0	0	0	0	0	0	0	0	0	0	0

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Table 4

RANKING OF THE EFFECTIVENESS OF AMBIENT AIR QUALITY MONITORING STATIONS IN THE VICINITY OF THE CUMBERLAND STEAM PLANT

Factor	Maximum Weighing Factor	Monitoring Station Value									
		1	3	5	7	8	9	10	12	13	18
A. Monitor-Average 3-hour Concentration	15	5	8	0	10	8	5	10	3	15	8
A. Monitor-Average 24-hour Concentration	15	10	10	0	10	5	5	15	5	10	10
B. Monitor-Average 3-hour Frequency	15	8	4	0	6	4	2	10	6	7	15
B. Monitor-Average 24-hour Frequency	15	9	7	0	9	2	4	12	10	8	15
C. Excesses NAAQS	15	0	7	0	15	7	0	0	0	7	0
D. Located in or Near Area of Botanical Impact	15	0	0	0	0	0	0	0	0	0	0
E. Monitor-Downwind Sector	10	10	10	4	4	0	0	1	6	0	10
Total	100	42	46	4	54	26	16	48	30	47	58
Rank		6	5	10	2	8	9	3	7	4	1

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Proposed Network

Based on the results of the modeling study and the evaluation of existing monitoring stations, the network shown in figure 7 is proposed for immediate implementation. The network consists of five stations, four of which will be retained from the existing network and one new station. The new station will be established by moving an existing station to a site that was identified by modeling studies as being impacted by high SO_2 concentrations during "A" atmospheric stability.

Existing stations 7, 10, 13, and 18 were retained because of their effectiveness in measuring maximum SO_2 concentrations with a high degree of frequency, and for providing a continuous record with which to document long-term air quality trends. Station 7 provides additional benefit by measuring the level of exposure to the populace in the city of Erin, Tennessee. According to modeling results, all stations except station 10 appear to monitor stability conditions "B" and "C" and are in close proximity to predicted "hot spots." Station 10 was selected based on its ranking for high 3- and 24-hour concentrations and because it was chosen by the Tennessee Division of Air Pollution Control for inclusion in the 1972 SIP monitoring plan. Station 3 was not chosen because of the infrequency that high concentrations can be expected to occur at this distance (28 km) from the steam plant. Station 5 was also omitted due to its remote location (27 km) and its low ranking score.

None of the existing stations, however, are near enough to the plant to provide data on SO_2 concentrations during very unstable atmospheric conditions ("A" stability). To provide coverage of this potentially significant condition, although such periods are infrequent, it is proposed that a new station be situated at a site approximately 1.5 km southwest of the steam plant. This site will be in a predicted high impact area for stability class "A."

The proposed network shown in figure 7 consists of existing stations 7, 10, 13, 18, and the new site P-1. Table 5 summarizes the objectives fulfilled by the proposed network. The decision to employ five stations for the recommended network at Cumberland has involved decisions about several subjective and practical factors.[3] While there is no substitute for "saturating" the plant's area of influence to obtain complete coverage, it is obvious for reasons of economy that such an approach is cost prohibitive. The monitoring plan recommended herein represents a reasonably logical consideration of all relevant factors and should satisfy current objectives for ambient monitoring at Cumberland Steam Plant.[4]

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3. The proposal of a specific site is made contingent upon the availability of a suitable plot of land and the arrangement of lease rights for its use. Certain practical considerations (i.e., availability of power) may require some slight modifications to the recommended network.

4. Monitoring data from station P-1, will be examined three years after the initiation of this proposed network. If this station is not impacted by the high SO_2 concentrations that were predicted under "A" stability, this station will be terminated.

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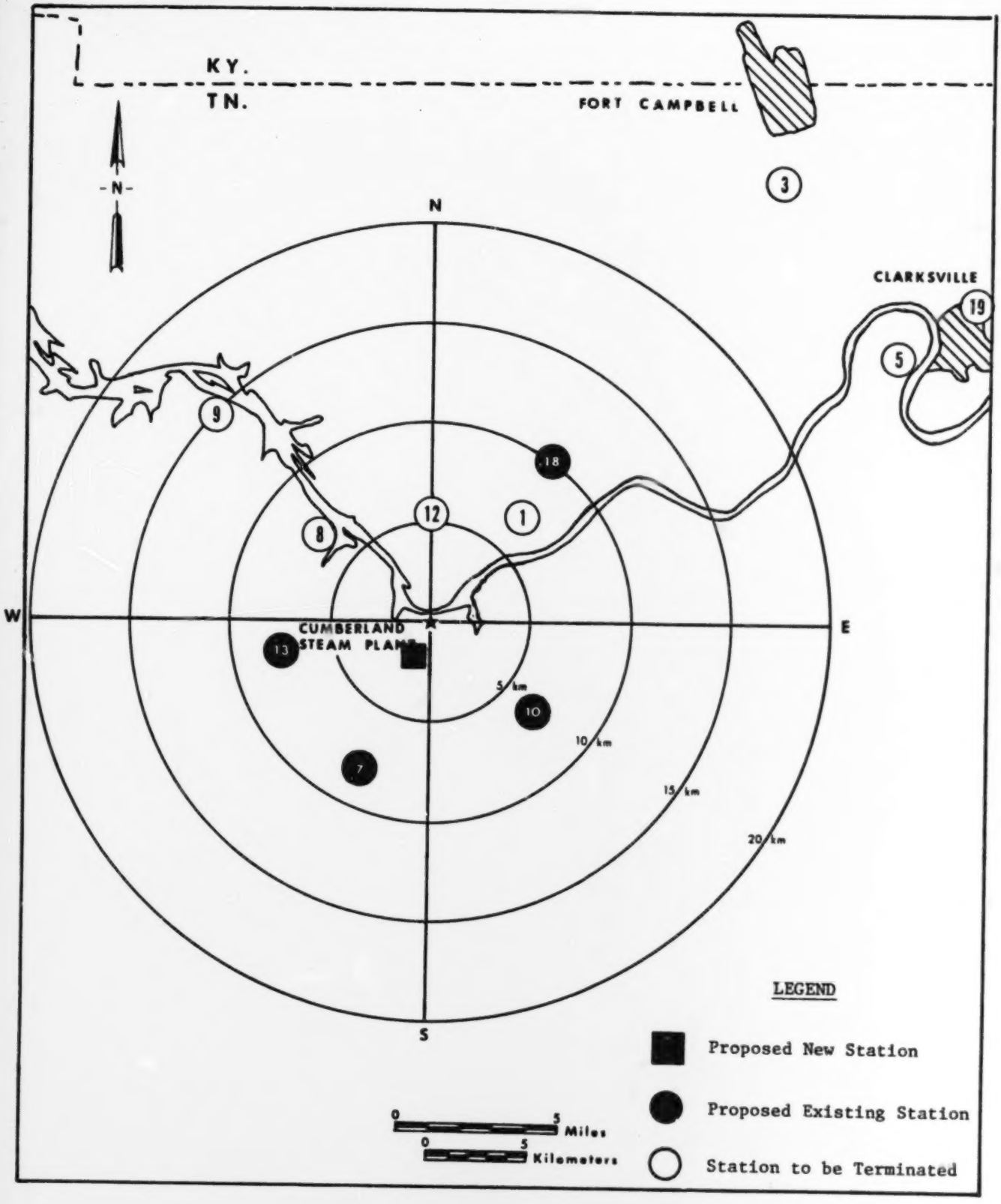

Figure 7. LOCATION OF STATIONS IN THE PROPOSED AMBIENT AIR QUALITY MONITORING NETWORK AT THE CUMBERLAND STEAM PLANT

Table 5

MONITORING OBJECTIVES ACHIEVED BY THE PROPOSED NETWORK

Station	Monitors	Distance (km)	Direction (^{o})	Monitoring Objectives Achieved
P-1	SO_2 & TSP	1.5	200	Maximum 3- and 24-hour average SO_2 concentrations (stability A).
7	SO_2 & TSP	8.2	205	High 3- and 24-hour average SO_2 concentrations (B and C stability), population center.
10	SO_2	7.4	130	High 3- and 24-hour average SO_2 concentrations and frequency (B stability).
13	SO_2	7.5	258	High 3- and 24-hour average SO_2 concentrations (B and C stability).
18	SO_2 & TSP	10.5	37	High 3- and 24-hour average SO_2 concentrations and frequency (C stability).

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APPENDIX A

TENNESSEE AIR POLLUTION CONTROL REGULATIONS AND LETTERS
FROM EPA APPROVING TVA SO_2 AND TSP MONITORING METHODS

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APPENDIX A

RULES
OF
TENNESSEE DEPARTMENT OF PUBLIC HEALTH
BUREAU OF ENVIRONMENTAL HEALTH SERVICES
DIVISION OF AIR POLLUTION CONTROL

CHAPTER 1200-3-14
CONTROL OF SULFUR DIOXIDE EMISSIONS

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1200-3-14-.01 General Provisions
1200-3-14-.02 Non-Process Emission Standards
1200-3-14-.03 Process Emission Standards

1200-3-14-.01 GENERAL PROVISIONS.

(1)

(a) For the purpose of this Chapter, each county in Tennessee will be classified by the Board into one of six categories, defined as Class I, Class II, Class III, Class IV, Class V and Class VI.

(b) Each class has been established with the essential limit necessary and predicted air quality.

(2) The county classifications are as follows:

(a) Class I - Polk

(b) Class II - Humphreys, Maury, Roane

(c) Class III - Sullivan

(d) Class IV - Shelby

(e) Class V - Anderson, Davidson, Hamilton, Hawkins, Knox, Rhea

(f) Class VI - All other counties

(3) Upon mutual agreement of the owner or operator of any air contaminant source and the Technical Secretary, an emission limit more restrictive than that otherwise specified in this Chapter may be established. This emission limit shall be stated as a special condition for any permit or order issued concerning the source. Violation of ths agreed to, more stringent emission standard is grounds for revocation of the issued permit and/or other enforcement measures provided in the Tennessee Air Quality Act.

(4) Regardless of the specific emission standards contained in this Chapter, all sources identified in rule 1200-3-9-.01-(4) of these regulations shall comply with the standards set pursuant to rule 1200-3-9.

(5) Regardless of the specific emission standards contained in this Chapter, new and/or modified sources in or significantly impacting upon a nonattainment area must comply with the provisions of paragraph 1200-3-9-.01-(5).

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Authority: T.C.A. Section 53-3412. Administrative History. Original Rule certified June 7, 1974. Chapter 1200-3-14 repealed. New Rule filed February 19, 1976, effective March 20, 1976. Amended effective March 21, 1979. Amended effective June 21, 1979.

1200-3-14-.02 NON-PROCESS EMISSION STANDARDS.

(1) Fuel Burning Installation in Operation Prior to April 3, 1972.

(a) The owner or operator of a fuel burning installation shall not cause, suffer, allow or permit the emissions from that source of sulfur dioxide in excess of that contained in Table 1:

TABLE 1

ALLOWABLE SO_2 EMISSIONS FOR FUEL BURNING INSTALLATIONS IN TERMS OF POUNDS PER MILLION BTU/HR HEAT INPUT
(One Hour Average)

Rated Capacity	Class I	Class II	Class III	Class V	Class VI
greater than 1000×10^6 BTU/hr.	1.2	1.2	2.4	4.0	5.0
less than 1000×10^6 BTU/hr.	1.6	5.0	2.4	4.0	5.0

(b) The owner or operator of a fuel burning installation in a Class IV County shall not cause, suffer, allow or permit emissions from that source of sulfur dioxide in excess of those listed in Table 2 or the following equation:

TABLE 2

FUEL	EMISSION LIMIT (one hour average)
Coal	4.0 lbs $SO_2/10^6$ BTU
No. 5 and No. 6 fuel oil and solid fuels other than coal	2.7 lbs $SO_2/10^6$ BTU
All other fuels	0.5 lbs $SO_2/10^6$ BTU

$$Q_{SO_2} = \frac{4.0X + 2.7Y + 0.5Z}{X + Y + Z}$$

Q_{SO_2} = Allowable Sulfur Dioxide Emissions in lbs $SO_2/10^6$ BTU

X = Heat input from coal

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Y = Heat input from No. 5 or No. 6 fuel oil and solid fuels other than coal

Z = Heat input from all other fuel

(c) In addition to the requirements of subparagraphs (a) and (b), every owner or operator of a fuel burning installation having a total rated capacity greater than 1000 million BTU per hour shall:

1. Demonstrate, to the satisfaction of the Technical Secretary, that the sulfur dioxide emitted, either alone or in contribution to other sources, will not interfere with attainment and maintenance of any primary or secondary ambient air quality standard.

2. Install and maintain air quality sensors to monitor attainment and maintenance of ambient air quality standards in the areas influenced by the emissions from such installation. Such shall be done in a manner prescribed by the Technical Secretary. Results of such monitoring shall be provided to the Technical Secretary in a manner and form as he shall direct.

(d) For purpose of this rule, the total heat input (based on maximum rated capacity) from all fuel combustion units at a plant, premises or installation shall be used for determining the maximum allowable emission of sulfur dioxide that passes through a stack or stacks. The heat value of the fuel that is not released within the fuel burning equipment shall not be considered as part of the heat input to the fuel burning installation.

(e) Fuel burning installations containing units of fuel burning equipment larger than 600 million Btu per hour heat input and which were commenced before April 3, 1972 shall comply with the applicable sulfur dioxide emission limit specified in Table 1 or Table 2 for fuel burning installations greater than 1 billion Btu per hour heat input. However, for fuel burning installations containing fuel burning equipment meeting these requirements, a 24-hour averaging basis shall be utilized rather than a one hour basis. For units of fuel burning equipment in a fuel burning installation of less than 600 million Btu per hour heat input, the allowable sulfur dioxide emission limits shall be those determined by Table 1 or Table 2 of Rule 1200-14-.02 (1)(a) or (1)(b).

(2) Fuel Burning Equipment Constructed After April 3, 1972.

(a) Fuel burning equipment with a rated capacity of 250 million BTU per hour or less heat input, shall not cause, suffer, allow or permit the emission of sulfur dioxide in excess of 1.6 pounds per million BTU heat input (one hour average) in a Class I county, 2.4 pounds in a Class III county, 4.0 pounds in Class V counties, nor in excess of 5.0 pounds per million BTU heat input (one hour average) in a Class II or VI county. Emission limits for Class IV counties shall be those listed in Table 2.

(b) The owner or operator of a fuel burning equipment with a rated capacity greater than 250 million BTU per hour heat input shall not cause, suffer, allow or permit the emissions from that source of sulfur dioxide in excess of the following:

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1. .80 lbs per million BTU heat input, maximum 1 hour average, when liquid fossil fuel is burned.

2. 1.2 lbs per million BTU heat input, maximum 1 hour average, when solid fossil fuel is burned.

3. Where different fossil fuels are burned simultaneously in any combination, the applicable standard shall be determined by proration. Compliance shall be determined by using the following formula:

$$\frac{Y\,(0.80) + Z\,(1.2)}{Y + Z}$$

(c) Where:

1. Y is the percent of total heat input derived from liquid fossil fuel and,

2. Z is the percent of total heat input derived from solid fossil fuel.

(3) Limiting the Effect of the Definition of Modification. If an owner or operator of fuel burning equipment, is ordered by the U. S. Department of Energy under the Energy Supply and Environmental Coordination Act of 1974, or any amendments thereto, or any subsequent enactment which supersedes such provisions, to switch fuels, required alterations to existing fuel burning equipment to accommodate these additional fuels shall not be deemed a modification for purposes of determining the allowable emissions as established by this rule.

Authority: T.C.A. Section 53-3412. Administrative History. Original Rule certified June 7, 1974. Amended effective March 20, 1976. Amended April 12, 1978. Amended June 16, 1978. Amended effective March 21, 1979.

1200-3-14-.03 PROCESS EMISSION STANDARDS.

(1) On and after July 1, 1975, the owner or operator of an air contaminant source located in a Class I county shall not cause, suffer, allow or permit the emission from that source of sulfur oxides (calculated as sulfur dioxide) in excess of 500 parts per million, 0.05 percent by volume, dry basis (one hour average). Different standards and averaging times may be met as an alternative, or as required, where they are specified in Chapter 1200-3-19.

(2) On and after July 1, 1975, the owner or operator of an air comtaminant source located in a Class II or Class III county shall not cause, suffer, allow or permit the emission from that source of sulfur dioxide in excess of 1000 parts per million, 0.10 percent by volume, dry basis (one hour average).

(3) On and after July 1, 1975, the owner or operator of an air contaminant source located in a Class IV, V or VI county shall not cause, suffer, allow or permit the emission from that source of sulfur dioxide in excess of 2,000 parts per million, 0.20 percent by volume, dry basis (one hour average).

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(4) A process source in a Class IV county as an alternative to the standard in paragraph (3) above may request from the Technical Secretary of the Tennessee Air Pollution Control Board to be regulated by not being allowed to exceed their sulfur dioxide emission capacity in 1974, on a twenty-four and an annual basis. These emissions will be specified in a Board Order, as a permit condition, or other legally enforceable manner. The Technical Secretary may approve such a request after being given adequate proof that this alternate standard will not cause any air quality standards to be violated and the company has an adequate continuous air monitoring network for determining the impact of its emissions.

(5) No person shall cause, suffer, allow or permit the emissions from any new air contaminant source in excess of those limits specified in Chapter 1200-3-14-.03, paragraph (1), (2) or (3), whichever is applicable. Regardless of the specific emission standard, new sources shall utilize the best available control technology as deemed appropriate by the Technical Secretary of the Tennessee Air Pollution Control Board.

(6) In addition to the requirements of rule .03, paragraph (1), (2) and (3), above, every owner or operator of an existing process emission source emitting more than 1000 tons of SO_2 during the calendar year 1972 or any other calendar year thereafter shall:

(a) Demonstrate, to the satisfaction of the Technical Secretary, that the sulfur oxides emitted, either alone or in contribution to other sources, will not interfere with attainment and maintenance of any primary or secondary ambient air quality standard.

(b) Install and maintain air quality sensors to monitor attainment and maintenance of ambient air quality standards in the areas influenced by the emissions from such installation. Such shall be done in a manner prescribed by the Technical Secretary. Results of such monitoring shall be provided to the Technical Secretary in a manner and form as he shall direct.

(7) All calculations performed pursuant to demonstration required by rule .03(6), shall assume that the process emission source is operating at a maximum rated capacity.

(8) For purposes of this Chapter, thermal oxidizers and incinerators shall be construed as process emission sources.

(9) Limiting the Effect of the Definition of Modification. For the purpose of determining the applicable sulfur dioxide emission standards in this rule, a change in fuel from natural gas, propane, butane and/or fuel oil to any of these herein named fuels and any required alterations to existing fuel burning equipment to accommodate these fuels shall not be considered a modification.

Authority: T.C.A. Section 53-3412. Administrative History. Original Rule certified June 7, 1974. Chapter 1200-3-14 repealed. New Rule filed February 19, 1976, effective March 20, 1976. Amended April 12, 1978. Amended June 16, 1978. Amended effective June 21, 1979.

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Authorization No. 0895

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
RESEARCH TRIANGLE PARK
NORTH CAROLINA 27711

November 8, 1979

John P. Blackwell
Chief, Air Quality Branch
Tennessee Valley Authority
River Oaks Building
Muscle Shoals, AL 35660

RE: Request for approval to operate designated SO_2 analyzers on nonconforming ranges.

Dear Mr. Blackwell:

This is in response to your October 8, 1979 request for approval to operate approximately 105 designated Philips PW 9700 SO_2 analyzers on ranges of 0-1, 0-2 and 0-5 ppm at various indentified sites in the TVA area.

We note your understanding that your monitoring is not subject to the SLAMS regulations, and we respect your desire to voluntarily comply with those regulations.

Request for 0-1 ppm range approval:

This letter shall constitute approval under section 2.5 of 40 CFR Part 58, Appendix C for your agency to operate any of the Philips PW 9700 SO_2 analyzers identified in your request on a range of 0-1 ppm.

Request for 0-2 ppm range approval:

Use of the 0-2 ppm range for those analyzers so identified in your submitted schedule is hereby approved under section 2.6.2 of 40 CFR Part 58, Appendix C subject to the following conditions:

1. that the resolution (smallest change in concentration that can be measured) is adequate for the intended objective of the monitoring and particularly if the measurements will be used in long-term averages to compare with the .03 ppm annual arithmetic mean primary standard;

2. that the analyzers will be used on the 2 ppm range only in the geographical area specified in the request for approval;

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3. that the conditions leading to SO_2 concentrations or the likelihood of concentrations over 1 ppm continue to exist in the specified geographical area; and

4. that the data quality control and quality assessment procedures required by Appendix A of 40 CFR Part 58 or other applicable quality assurance requirements are appropriately adapted to the 2 ppm range.

Please notify this office within 30 days of any change in the above conditions which might affect this approval.

Request for 0-5 ppm range approval:

In regard to operation on a 0-5 ppm range, we are highly concerned about the effective resolution of the overall measurement system, including the analyzers as well as the measurement recording device. The attached letter to the Arizona Department of Health Services describes our concerns more detail and specifies the conditions under which we will consider approval. We also must consider the fact that changing range on the Philips PW9700 analyzer affects the chemical equilibrium of the measurement cell and may thus affect analyzer performance.

In view of these circumstances, we cannot approve any analyzer on a 0-5 ppm range until we have more information about the operation of the specific analyzers proposed for 0-5 ppm operation. Therefore, under section 2.7.5 of 40 CFR Part 58, Appendix C, we request additional information in the following areas:

1. The specific use or limits that will be put on the use of the measurements obtained with analyzers operating on the 0-5 ppm range;

2. The effect of the 0-5 ppm range on the performance of the Philips PW9700 SO_2 analyzer compared with its performance on the 0-0.5 ppm or 0-1 ppm range;

3. The type of data recording device or system that will be used and rationale supporting the adequacy of the overall resolution of the measurement system with respect to item 1; and

4. The nature and extent of quality assurance procedures that would be used with the 0-5 ppm range.

Department E will be available to discuss this determination or any of the issues with you further if you desire.

Sincerely yours,

Larry J. Purdue
Department E (MD-77)
Methods Standardization Branch
Quality Assurance Division

11/13/79--RVC:HH
mc: C. H. Smith, 350 EB-K
N. T. Lee, 124F ROB-M
A. E. Owen, 124C ROB-M

cc: Doyle T. Brittain,
EPA, Region IV

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
RESEARCH TRIANGLE PARK
NORTH CAROLINA 27711

April 10, 1980

Mr. John P. Blackwell
Chief, Air Quality Branch
Tennessee Valley Authority
River Oaks Building (Room 100A)
Muscle Shoals, Alabama 35660

Dear Mr. Blackwell:

Your proposed modifications to the Federal reference method for measuring total suspended particulates in the atmosphere, consisting of (1) replacing the rotameter with an orifice plate and differential pressure gage as the flow rate measuring device, and (2) modifying the calibration method to use a precision flow orifice calibrated by water flow as the flow standard, as detailed in your request dated March 19, 1980, is hereby approved. No special approval is necessary for the use of constant flow controllers.

Sincerely yours,

Larry J. Purdue
Methods Standardization Branch
Quality Assurance Division

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